

Charles H. Thornton

Towering Builder of Towering Buildings

By Richard G. Weingardt, P.E.



Charles H. Thornton. Courtesy of C.H. Thornton and Thornton-Tomasetti Group.

In addition to being a structural engineering icon, Charles Henry “Charlie” Thornton, Jr. has made a significant impact by interesting students in engineering and attracting much-needed talent to the profession. In the area of high-rises, he is best known for his structural design of Petronas Towers and Taipei 101, each the tallest building in the world upon its completion. In addition to impressive edifices such as these, greatly adding to Thornton’s stature as a giant in the profession are countless high-profile, mixed-use projects and numerous innovative sports facilities, including Comiskey Park in Chicago, Pepsi Center in Denver, Anaheim Arena in California, and the Bulls-Blackhawks Stadium in Chicago.

Along with such elite engineering accomplishments, Thornton is chairman emeritus of the Salvadori Center, founded in the 1970s by the engineering legend Mario Salvadori, which each year graduates hundreds of struggling New York City (NYC) middle-school students in mathematics and science and in the use of architectural and engineering principles. Thornton is also the founder of the ACE

Mentor Program, a non-profit, NYC-based organization that offers guidance to inner-city high-school students in Architecture, Construction and Engineering. ACE also offers high-school seniors and college students counseling and scholarships. The program is purposely designed both to aid young people and to pump fresh blood into a construction industry critically short of talent. The NYC program has spawned more than a dozen other ACE programs in cities across the country. In 2001, *Engineering News-Record* (ENR) presented Thornton with its prestigious Award of Excellence, with the citation: “For championing ACE; for being the consummate mentor and role model; for coming to the aid of an industry in brain-drain mode; and for taking ACE national.”

Thornton Tomasetti (TT), the firm Thornton and Richard Tomasetti founded in 1977 after purchasing Lev Zetlin Associates (LZA), grew from a 50-person local firm to a 500-person, multi-disciplinary, global engineering firm with annual gross revenues of more than \$60 million. In 2007, it was ranked 150th in the



Thornton in the classroom teaching youngsters structural principles by using a rope bridge model. Courtesy of C.H. Thornton and Thornton-Tomasetti Group.

ENR top 500 design firms. Although still a consultant to TT, Thornton retired from the firm in January 2005, when he founded Charles H. Thornton and Company, LLC, a management and strategic consulting firm located in Easton, Maryland.

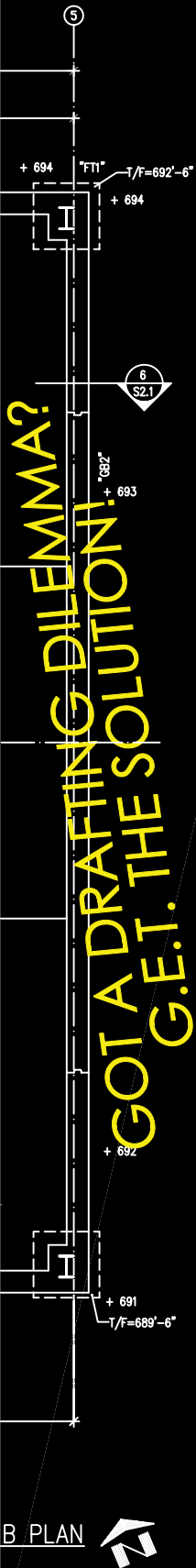
Charlie was born on April 11, 1940, in Bronx, New York, the second son of Charles H. and Evelyn (Heinemann) Thornton. Charles, Sr., a skilled electrician and bricklayer, was the chief building inspector for Bronx, NY, when his three sons were youngsters. While growing up, Thornton said, “There were always construction materials like stacks of bricks in our back yard for building things. Our life as boys was like the *Leave It To Beaver* television series and I thought my parents were Ward and June Cleaver. My parents never fought and we did everything together.”

All three Thornton youngsters – Bill, Charlie and Robert – liked being outdoors and spent much of their childhood together hiking, hunting, boating and canoeing. When he was ten, Charlie and Bill kayaked on the dangerous waters under the Whitestone Bridge, without



American Airlines Hanger. Los Angeles and San Francisco, CA. Courtesy of C.H. Thornton and Thornton-Tomasetti Group.

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Petronas Towers, Kula Lumpur City Centre, Malaysia, 1998 (452 meters tall) Courtesy of C.H. Thornton and Thornton-Tomasetti Group.

lifejackets, something that did not meet with the approval of their parents. Bill, the oldest and the first Thornton to go to college and earn a PhD, was an inspiration to Charlie.

Charlie's interest in becoming a structural engineer was sparked early. His father often took him to construction job sites, and he remembers his father calling his attention to the engineers when they were present. They were always well-dressed and looked impressive. Thornton recalled his father pointing them out and saying, "See that fellow? He's an engineer and a really smart guy. Plus, when it gets really hot or cold, he can go inside. That's what you should become."

While in junior and senior high, and during summers while in college, Thornton worked at construction, hammering nails, pushing wheel-barrels, pouring concrete and erecting steel and timber beams and columns, and doing surveying. Tall and skinny in high school, Charlie did not participate in school sports or extracurricular activities – and he developed a painful shyness.

After graduating from Iona Preparatory School in New Rochelle, NY, Charlie entered Manhattan College to study civil engineering. He did not especially like the mandatory pre-engineering coursework, but once he got into engineering classes, he was in his element. He could not get enough of them. With his brother Bill as an example, his plan was to go for the highest degree he could get in engineering.

In 1957, while employed at a summer job on the construction of the 60-story Chase Manhattan Bank headquarters, Charlie met his first engineer role model – Eugene Fullam. Though only 29 years old at the time, Fullam was in charge of constructing one of the deepest foundations in Manhattan. Said Thornton, "Gene impressed upon me that you don't have to be 50 before you succeed. It made me want to be like him."

After receiving his bachelor's degree from Manhattan College in 1961, Thornton went straight to New York University (NYU) for a master's degree – and he started working part-time for Lev Zetlin, a pacesetter and outspoken consulting structural engineer. After earning his master's degree in 1963, Thornton continued on with Zetlin's firm – Lev Zetlin Associates (LZA) – while taking classes at NYU for a doctoral degree in structural engineering, which he received in 1966. Charismatic, brilliant and arrogant, Lev Zetlin was difficult to work for but a master at

getting clients to try innovative structural systems – and to pay top dollar for structural engineering services. "He was a big picture thinker who always got owners to pay the proper fee to do it right," said Thornton.

Early in his career with LZA, Thornton worked on the first of many of his outstanding projects, two giant hangars for American Airlines. These super hangars, which housed 747s and other jumbo jets of the future, were located in Los Angeles and San Francisco. Working with his future partner Richard Tomasetti while both men were still in their 20s, Thornton developed the first-ever stressed-skin hypars, using light-gage steel elements, to create long cantilevers and large column-free clear spans. Because of the complexity of the structure, he got involved with the contractor's means and methods for erecting it. This is something in which Thornton still believes – he is a major proponent of building information modeling (BIM) and of structural engineers controlling geometry and dimensions, since the structural systems are the first ones constructed.

In 1971, Thornton was a member of the LZA management team responsible for the transition of the firm into Gale Industries, a New York Stock Exchange company. From



American Airlines Hanger under construction. Los Angeles and San Francisco, CA. Courtesy of C.H. Thornton and Thornton-Tomasetti Group.



Taipei 101, Taipei, Taiwan, 2004 (509 meters tall) Courtesy of C.H. Thornton and Thornton-Tomasetti Group.

1971 to 1977, in spite of the 1973 Arab oil embargo and the worst recession for the construction industry since the 1930s, the company doubled in size and was profitable. In 1977, Thornton and Tomasetti purchased Gale's LZA Group, eventually renaming it the Thornton-Tomasetti Group (TTG), the predecessor to today's Thornton Tomasetti (TT). By 1993, TTG's annual revenues had grown from \$3 million to \$16 million, and the company had succeeded in becoming one of the leading structural and forensic engineering firms in the U.S.


Once he had graduated from college and started his career, Thornton vowed to get over his severe shyness, and to hone his communications and leadership skills to the fullest. To get over his tendency to withdraw and hesitancy about public speaking, he taught at Cooper Union. It helped him come out of his shell. He now speaks, with no reservations and with great ease, to any size audience, within and outside the profession. Says Thornton, "I'm as comfortable speaking to a group of a couple thousand people as I am a small gathering of close friends."

Over the years, in addition to Cooper Union, Thornton has been a visiting lecturer or professor at such institutions of higher learning as Catholic University, Princeton University, Pratt Institute and Manhattan College. He holds four honorary degrees, from Connecticut, Clarkson, Hartford and Rensselaer Polytechnic Institute. Thornton is a registered professional engineer in 25 states, and the author (or co-author) of numerous technical papers, as well as a book, *Exposed Structure in Building Design*, published by McGraw-Hill in 1993.

As a recognized expert in structural analysis, an international engineering lecturer and a global businessman, Thornton has become a leader of men and women around the world, and a role model and mentor to many. William Bast, principal in charge of TT's forensic group in Chicago, said, "Charlie is one of my main role models and mentors. Always encouraging and supportive, he helped build my confidence. Once, I was engaged as an expert witness on a lawsuit and, one day, in walked one of the most famous structural engineers in the country, representing the opposing party. It really rattled me. I told Charlie about it and he said, 'Oh, don't worry about it. You can hold your own with him. Your position and analysis of the situation and engineering problem are correct.' And he was right. I was able to 'hold my own' with that engineering superstar."

In 1978, Daniel Cuoco, current TT president, worked closely with Thornton on the company's first high-rise, One Tampa City Center. The structural system for the 40-story, high-profile building was a classic "Denver Frame," a concrete center core resisting all lateral forces and structural steel framing all around it carrying the vertical loads. The core was constructed using slip form techniques. The latest finite element computer analysis was employed in designing the structure. Said Cuoco, "Charlie's not afraid to speak his mind and he is always looking for new, different and better ways to do things – and always trying to get people around him to do the same. 'To think outside the box,' is an understatement for Charlie."

During the schematic design phase for the Petronas Towers, which used super-high-



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Taipei 101, Taipei, Taiwan, 2004 (509 meters tall) Courtesy of C.H. Thornton and Thornton-Tomasetti Group.

often repeated: regardless of complexity, you should reach a reasonable structural solution using simple analogies and hand calculations. If not, re-check the computer model first!"

Thornton's lifetime of achievements have earned him countless awards and honors. Significant ones are the 2001 Award of Excellence from ENR, 2002 Hoover Award from ASCE and several other engineering societies, 2002 Honor Award from the National Institute for Building Sciences (NIBS) and 2003 Award Medal from the Benjamin Franklin Institute. He is an honorary member of ASCE and AIA, and a member of the National Academy of Engineering. Active in numerous engineering and non-engineering organizations, Thornton has held high positions and elected office in many of them, including: Manhattan College, board of trustees; National Institute of Building Sciences (NIBS), board member; Society of American Military Engineers (SAME), national director and NYC Post president; Applied Technology Council (ATC), board of directors and president; Gunston Day School, board of trustees; Chesapeake Bay Maritime Museum, board member; Stamford Yacht Club, board of directors; and Dolphin Cove Yacht Club, commodore.

Thornton married Patricia Podaski on September 9, 1961. They had three children – Diana, Katherine and Charles III. In late 1978,

Patricia succumbed to Hodgkin's Disease. Thornton married Carolyn Heldman on June 6, 1981. They had one daughter, Rebecca. Thornton is proud that his son Charles III, at age 32, was Turner Construction's project manager in charge of Invesco Field at Mile-High in Denver and was crucial in the record-setting stadium being completed on time and as budgeted.

Thornton has pithy advice for today's beginning engineers and emerging leaders: "In your 20s, be a sponge, learning everything you can and watching those around you who know how. In your 30s, develop lasting relationships, hone your communications skills and develop your full leadership potential. In your 40s, be a leader in your company – or own your own firm. In your 50s, reap the benefits of all your hard work and, in your 60s, *do something else.*"

This is exactly what Thornton did and is doing. Not playing golf or idling away time, he is busier today than ever.■

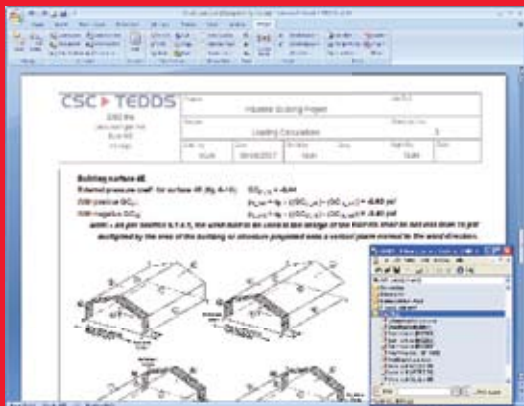
Richard G. Weingardt, P.E., is the CEO of Richard Weingardt Consultants, Inc. Denver, CO. He is the author of eight books. His latest Engineering Legends, published by ASCE Press, features numerous great American structural engineers. He can be reached at rweingardt@aol.com.

strength, 18,000-psi concrete as its main structural material, Leonard Martin Joseph, Senior Vice President of TT, said, "Charlie filled one of his ever-present yellow scratch pads with hand calculations and sketches on the 24 hour trip back to New York from a Kuala Lumpur meeting. He showed me the pad, but held onto it while we designed and analyzed the structure by computer. When we were done, the close correspondence between the two methods was impressive and reassuring. The lesson was clear, and

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